SYROVATSKIY, I.Ya.

Effect of salinization on the propagation of fresh-water and semi-migratory fishes in the Veselovskoye Reservoir. Zool. zhur. 34 no.4:850-860 Jl-Ag '55. (MIRA 8:9)

1. Biologicheskiy nauchno-issledovatel'skiy institut Rostovskogo gosudarstvennogo universiteta imeni V.M.Molotova
(Veselovskoye Reservoir--Fishes)

SYROVATSKIY, I.Ya.

Utilization of new reservoirs for commercial fishing. Reviewed by I.IA. Syrovatskii. Vop.ikht. no.6:179-183 '56. (MLRA 9:8)
(TSimlyansk Reservoir--Fisheries)

SYROVATSKIY, I.Ya.

The eurytopic ability of the roach Rutilus rutilus heckeli (Nordm.). Nauch. dokl. vys. shkoly; biol. nauki no.2:48-50 '61. (MIRA 14:5)

1. Rekomendovana kafedroy gidrobiologii Dnepropetrovskogo gosudarstvennogo universiteta im. 300-letiya vossoyedineniya Ukrainy s Rossiyey.

(ROACH (FISH))

SYROVATSKIY, I.Ya.

Comparative characteristics of Don and Kuban roaches. Vop. ekol. 5:212-213 '62. (MIRA 16:6)

1. Azovskiy nauchno-issledovatel'skiy institut rybnogo khozyaystva, Rostov-na-Donu.
(Don River--Roach (Fish)) (Kuban River--Roach (Fish))

SYROVATSKIY, M.

Reconstructing a feather-picking machine. Mias.ind.SSSR 25 no.2:60 '54. (MLRA 7:5)

1. Nikovayevskiy ptitsekombinat. (Poultry industry)

SYROVATSKIY, S. I.

USSR / Radio Physics. Propagation of Radio Waves. I-6

Abs Jour : Ref Zhur - Fizika No 3, 1957, No 7311

Author : Syrovatskiy, S.I.
Inst : Physics Institute imeni P.N. Lebedev, Academy of Sciences, USSR
Title : Stability of Tangential Discontinuities in a Magnetohydrodynamic Medium

Orig Pub : Zh. eksperim. i teor. fiziki, 1953, 24, No 6, 622-630.

Abstract : The types of discontinuities that are possible in an arbitrary magnetohydrodynamic medium are classified: The tangential discontinuity (the normals to the surface of discontinuity of the velocity component v_n and of the magnetic field H_n are equal to zero); shock wave ($H_n=0$, $v_n\neq0$); magnetohydrodynamic wave (H_n and v_n differ from 0 and are continuous); oblique wave (H_n and v_n discontinuous). If $v_n=0$ and $H_n\neq0$, the discontinuity represents merely the separation boundary between two different media. The only one of these types that can be realized in an incompressible liquid are the tangential discontinuity

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$$\omega = k\left[\frac{v}{2} \pm \tfrac{1}{2}\left(\tfrac{2}{\rho}(H_1^2 + H_2^2) - v^2\right)^{1/2}\right]$$

where v is the jump in velocity, ρ the density of the medium, H_1 and H_2 the projections of the magnetic field on the boundary of the discontinuity along thedirection of the jump in velocity. ω has a positive imaginary part when $(H_1^2 + H_2^2)/4\pi\rho < \rho v^2/2$,

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SYROVATSKIY, S.I.

USSR

Syrovatskiĭ, S. I. Instability of tangential discontinuities in a compressible medium. Akad. Nauk SSSR. Žurnal Eksper. Teoret. Fiz. 27, 121–123 (1954). (Russian) 1-F/H

Let the half-space $x>0$ (<0) be filled with fluid moving with constant velocity v_0 (0) parallel to the y-axis. By considering general exponential plane-wave solutions of the linearized system of partial differential equations for time-dependent perturbations subject to appropriate boundary conditions at the perturbed discontinuity surface, the author concludes that for all v_0 the motion is unstable. This contradicts L. D. Landau's earlier conclusion [C. R. (Doklady) Acad. Sci. URSS (N.S.) 44, 139–141 (1944); these Rev. 6, 191], obtained by use of plane waves of very special form, that for large enough v_0 the motion is stable.

J. H. Giese (Havre de Grace, Md.).

Physics Inst. im. P. N. Lebedev Acad Sc USSR

Syrovatskiy, S.I.

SYROVATSKIY,S.I.

In the Department of Physicomathematical Sciences; discussion on problems of cosmogony. Vest.AN SSSR 25 no.9:92-94 S'55.
(Cosmogony) (MLRA 8:12)

SYROVATSKIY, S.I., kandidat fiziko-matematicheskikh nauk.

Some properties of disruptive discharge surfaces in magnetic fluid dynamics. Trudy Fiz inst. 8:13-64 '56. (MLRA 10:3)

1. Fizicheskiy institut AN SSSR imeni P.N.Lebedeva.
(Magnetic fields) (Cosmic rays)
(Sun—Atmosphere)

SYROVATSKIY, S.I.

55-3-2/30

AUTHOR SYROVATSKIY, S.I.

TITLE Magnetic Hydrodynamics
(Magnitnaya Gidrodinamika. Russian)

PERIODICAL Uspekhi Fiz. Nauk , 1957, Vol 62, Nr 3, pp 247 - 303 (U.S.S.R.)

ABSTRACT

Magnetic hydrodynamics occupies itself with the effect of an electromagnetic field on liquid and gaseous conductors which are conceived as dense matter. Magnetic hydrodynamics plays a part in the following problems: motion of Hg in the magnetic field (reactor pumps), motion of cosmic gas masses, development of cosmic radiation, development of cosmic and terrestrial magnetism, polarization of the light of remote stars, behavior of a plasma in the magnetic field. The present condensed report deals with the developement of the theory of magnetic hydrodynamics. 145 references are used in it.
The article deals with the following problems:

1.) Fundamental equations
2.) Expansion of small perturbations
   a) entropy wave
   b) magnetic hydrodynamic wave
   c) magnetic sound wave
3.) Surface of the explosion, and the shock wave

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55-1-2/20

Magnetic Hydrodynamics

a) tangential explosion
b) vertical shock wave
c) magnetic hydrodynamic wave
d) inclined shock wave

4.) Some solutions of the magnetic hydrodynamic wave

a) problems of magnetic hydrostatics
b) steady solutions
c) magnetic hydrodynamic waves of any amplitude
d) non-steady motions

5.) Amplification of the magnetic field. Hydromagnetic dynamo

6.) Problems of stability

a) stability of gravitation
b) thermoconvection in the magnetic field
c) stability of a simple current in the magnetic field

7.) Magnetic hydrodynamic turbulence

a) conditions of the increase of a magnetic field in a turbulent medium

Card 2/3

BAYER, V.N.[translator].; SYROVATSKIY, S.I., red.; BURTSEV, A.K., red.; SOKOLOVA, T.S., tekhn. red.

[Electromagnetic structure of atoms and nucleons; a collection of articles][translated from the English] Elektromagnitnaia struktura iader i nuklonov; sbornik statei. Moskva, Izd-vo inostr. lit-ry, 1958. 204 p. (MIRA 11:11)

(Nuclear physics)

SOV/56-35-6-21/44

10(4), 24(3)

AUTHOR: Syrovatskiy, S. I.

TITLE: On the Stability of Shock Waves in Magnetohydrodynamics (Ob ustoychivosti udarnykh voln v magnitnoy gidrodinamike)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol 35, Nr 6, pp 1466-1470 (USSR)

ABSTRACT: In his introduction the author expresses the opinion that the stability of shock waves in magnetohydrodynamics has hitherto not been investigated. The present paper intends to investigate the interaction between shock waves in a magnetic field and magnetohydrodynamic waves with small amplitudes. First, previous papers dealing with this subject are discussed (Refs 1-5). The case is investigated in which the shock wave may, in magnetohydrodynamics, be considered to be two-dimensional, i.e. that the system of coordinates may be chosen in such a manner that the vectors of the magnetic field ($\vec{H}$) and of the velocity ($\vec{v}$) are located in one plane on both sides of the shock wave front. $\vec{v}$ and $\vec{H}$ are assumed to be in the (x,y)-plane, and the shock wave front is assumed to coincide with the plane x=0. For the case of an inclined shock wave,

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On the Stability of Shock Waves in Magnetohydrodynamics

the boundary equations for perturbations on the discontinuity surface x=0 are divided into two groups: one of them contains the z-components of the perturbations $\vec{w}$ and $\vec{h}$ of the velocity and of the field strength, the other group does not contain these components. The author confined his attention to perturbations of the form $e^{i(kx-\omega t)}$ propagating along the normal of the shock wave front. On the basis of these conditions the author derives the stability condition with respect to the spontaneous emission of weak magnetohydrodynamic waves by a shock wave. Also the conditions are investigated under which the linear equations for a small perturbation have no solution. This case is explained as a disintegration of the shock wave. There are 6 Soviet references.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P.N. Lebedev of the Academy of Sciences, USSR)

SUBMITTED: June 19, 1958

Card 2/2

21(7)
AUTHORS: Kozchak, A. A., Syrovatskiy, S. I. SOV/2o-122-5-12/56

TITLE: On the Possibility of the Preferential Acceleration of Heavy Elements in the Sources of Cosmic Rays (O vozmozhnosti preimushchestvennogo uskoreniya tyazhelykh elementov v istochnikakh kosmicheskikh luchey)

PERIODICAL: Doklady Akademii nauk SSSR, 1958, Vol 122, Nr 5, pp 792 - 794 (USSR)

ABSTRACT: In the primary component of cosmic radiation the nuclei with the nuclear numbers $Z_o > 2$ (in relation to the protons and α-particles) are on the average 5 to 10 times as frequent as in the interstellar space. This may be explained either by the higher number of elements with $Z_o > 2$ in the sources of cosmic rays or by their more effective acceleration. The present paper investigates the second possibility on the basis of the example of the statistical mechanism (E.Fermi) (Ref 2). In the sources of cosmic radiation there may exist conditions that favor the predominant

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On the Possibility of the Preferential Acceleration of Heavy Elements in the Sources of Cosmic Rays

SOV/20-122-5-12/56

acceleration of heavy elements. A formula for the increase of the total energy E of the particle with time is written down. However, the particle also loses energy by its collisions with atoms and electrons. It depends on the ratio between the obtained and the lost energy whether the particle is accelerated or not. A formula for the threshold energy (usually called injection energy) is written down. The deliberations discussed in this paper are indicative of a higher efficacy of the acceleration of heavy elements in the case of the amount of initial ionization being equal. The range of values of the parameter α, in which the heavy elements are predominantly accelerated, is rather narrow, and therefore the chance occurrence of the necessary value of α would, under real conditions, be little probable. However, in a system that contains a gaseous magnetic medium and the particles to be accelerated, there must be automatic control, and it is because of this fact that α necessarily belongs to the aforementioned range of values. The

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SYROVATSKIY, S.I.

PHASE I BOOK EXPLOITATION SOV/3762

Konferentsiya po magnitnoy gidrodinamike. Riga, 1958.

Voprosy magnitnoy gidrodinamiki i dinamiki plazmy; trudy Konferentsii. (Problems in Magnetohydrodynamics and Plasma Dynamics; Transactions of a Conference) Riga, Izd-vo AN Latviyskoy SSR, 1959. 343 p. Errata slip inserted. 1,000 copies printed.

Sponsoring Agency: Akademiya nauk Latviyskoy SSR. Institut fiziki.

Editorial Board: D.A. Frank-Kamenetskiy, Doctor of Physics and Mathematics, Professor; A.I. Vol'dek, Doctor of Technical Sciences, Professor; I.M. Kirko, Doctor of Physics and Mathematics; V.Ya. Veldre, Candidate of Physics and Mathematics; V.G. Vitol, Candidate of Physics and Mathematics; Yu.M. Kruzin'; and V.Ya. Kravchenko.

Ed.: A. Teytel'baum; Tech. Ed.: A. Klyavinya

PURPOSE: This book is intended for physicists working in the field of magnetohydrodynamics and plasma dynamics.

COVERAGE: This volume contains the transactions of a conference held in Riga, June 1958, on problems in applied and theoretical magnetohydrodynamics. The objects of the conference were the investigation of the basic trends in theoretical and applied magnetohydrodynamics, establishing contact between the people doing research in different branches of magnetohydrodynamics, and promoting the participation of theoretical physicists in problems in applied magnetohydrodynamics. More than 160 persons from different parts of the Soviet Union took part in the conference, and 55 papers were read. Similar conferences are to be held regularly in the future; the next such conference is scheduled to be held in Riga in June 1960. In this present collection of the transactions of the conference, most of the papers and comments on papers are presented by the authors themselves in an abridged form. The book is divided into two parts: the first part deals with problems in theoretical magnetohydrodynamics and plasma dynamics, and consists of 35 articles on such aspects of the problem as the application of magnetohydrodynamics in astrophysics (D.A. Frank-Kamenetskiy), magnetohydrodynamics and the investigation of cosmic-ray variations (L.I. Dorman), acceleration of plasma in a magnetic field (G.V. Gordeyev and A.I. Gubanov), stability of shock waves and magnetohydrodynamics (A.I. Akhiyezer). The second part, consisting of 33 articles, deals with problems of experimental magnetohydrodynamics, including the application of physical simulation for investigation of electromagnetic processes in liquid metals (I.M. Kirko) and the development of electromagnetic pumps (P.G. Kirillov), at the Institute of Physics of the Academy of Sciences, Latvian SSR. Several articles are devoted to induction pumps, electromagnetic crucibles, electromagnetic stirrers for molten metals, and their application in the metallurgical industry including schematic diagrams of their power-supply systems. References are given at the end of most of the articles.

Card 6/12

SYROVATSKIY, S.I.

"COSMIC RAY COMPOSITION"
S.I. Syrovatskiy, A.A. Korchak

The role of energy losses in cosmic ray particle acceleration is discussed. The possibility of preferential acceleration of heavy nuclei has been discovered. An attempt has been made to explain the observed composition of cosmic rays at the Earth on the basis of preferential acceleration of heavy nuclei in cosmic ray sources.

report presented at the International Cosmic Ray Conference, Moscow, 6-11 July 1959

84586

S/169/60/000/009/004/007
A005/A001

24.6900 (1138, 1191, 1559)

Translation from: Referativnyy zhurnal, Geofizika, 1960, No. 9, p. 175, # 11397

AUTHOR: Syrovatskiy, S.I.

TITLE: The Spectrum of Cosmic Rays and Their Role in Cosmic Gas Dynamics

PERIODICAL: V sb.: Vopr. magnitn. gidrodinamiki i dinamiki plazmy. Riga, AS LatvSSR, 1959, pp. 45-48

TEXT: The present hypotheses of cosmic ray origin make it possible to explain the observed differential energy spectrum

$$N(\mathcal{E})\,d\mathcal{E} = k\mathcal{E}^{-\gamma}d\mathcal{E},$$

where $\gamma = 1 + 1/\alpha T$, with $2 < \gamma < 3$. Here α is a certain coefficient, and T is the average particle-acceleration time. However, in consequence of the strong dependence of γ on α and T and the possible variations of α and T in wide limits for the various cosmic objects, the value $\gamma \approx 3$ appears as random. It seems to be more probable that the energy spectrum of the cosmic rays represents the consequence of the general properties of dynamics of gaseous objects. It is assumed that

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S/169/60/000/009/004/007
A005/A001

The Spectrum of Cosmic Rays and Their Role in Cosmic Gas Dynamics

The system embracing the turbulent ionized medium and relativistic particles, tends to the dynamic equilibrium state, for which the energy of the relativistic particles and the turbulence energy are connected by the correlation

$$E_{rel} = \delta E_{turb},$$

where $\delta \approx 1$. If an intense turbulent motion arises within an arbitrary limited volume (as an example, the flash of a Supernova) and acceleration of the particles up to relativistic energies begins, the total energy of the system diminishes in consequence of the leakage of the relativistic particles into the surrounding space. It is shown that the energy spectrum of these particles has the form

$$N(\varepsilon)\, d\varepsilon = K\varepsilon^{-(2+\delta)}\, d\varepsilon ,$$

where the exponent is $\gamma = 2 + \delta \approx 3$, ($\delta \approx 1$). Because the obtained form of the spectrum does not depend on the specific properties of the source, the sum

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S/169/60/000/009/004/007
A005/A001

The Spectrum of Cosmic Rays and Their Role in Cosmic Gas Dynamics

spectrum of the cosmic rays in the same also for the existence of a great quantity of sources.

N.S. Kaminer

Translator's note: This is the full translation of the original Russian abstract.

Card 3/3

3(1),24(7) SOV/33-36-1-4/31

AUTHOR: Syrovatskiy,S.I.

TITLE: The Distribution of Relativistic Electrons in the Galaxy and the Spectrum of Magnetic Bremsstrahlung Radio Emission

PERIODICAL: Astronomicheskiy zhurnal,1959,Vol 36,Nr 1,pp 17-32 (USSR)

ABSTRACT: Under consideration of the regular changes of the energy of the particles the problem on the diffusion of particles is solved theoretically. Under assumptions on the sources in the interstellar space the author found the space distribution and energy spectrum for electrons, the energy changes of which are caused by losses due to radiation in the magnetic field. A special case is discussed in detail. The energy spectra of electrons and the corresponding intensity of magnetic bremsstrahlung radiation were calculated and the obtained results are discussed. There are 2 figures, and 10 references, 7 of which are Soviet, 2 American, and 1 Australian.

ASSOCIATION: Fizicheskiy institut imeni P.N.Lebedeva Akademii nauk SSSR (Physical Institute imeni P.N.Lebedev of the AS USSR)

SUBMITTED: February 6, 1958

Card 1/1

ZHDANOV, G.B., glavnyy red.; IVANENKO, I.P., zam.glavnogo red.; SYROVATSKIY, S.I., otv.red.toma; KHRENOV, B.A., zam.red.toma; GERASIMOVA, N.M., red.; NIKISHOV, A.I., red.; ZATSEPIN, V.I., red.; DORMAN, L.I., red.; TULINOV, V.F., red.; FEDOROV, V.M.; VAVILOV, Yu.N., red.; ABRASIMOV, A.T., red.; FRADKIN, M.I., red.izd-va; BRUZGUL', V.V., tekhn.red.

[Radiation belts of the earth. Primary cosmic radiation and its properties and origin] Radiatsionnyi poias Zemli. Pervichnoe kosmicheskoe izluchenie, ego svoistva i proiskhozhdenie. Moskva, Izd-vo Akad.nauk SSSR, 1960. 258 p. (Trudy Mezhdunarodnoi konferentsii po kosmicheskim lucham, no.3) (MIRA 14:2)

1. International Conference of Cosmic Radiation. (Cosmic rays)

PHASE I BOOK EXPLOITATION SOV/4413

International Cosmic Ray Conference. Moscow, 1959.

Proceedings. v. III. Moscow, 1960. 253 p. Errata slip inserted. No. of copies printed not given.

Sponsoring Agency: International Union of Pure and Applied Physics. Cosmic Ray Commission.

Ed.: S. I. Syrovatskiy, Editorial Board: G. B. Zhdanov (Ed.-in-Chief), I. P. Ivanenko (Assistant Ed.-in-Chief), N. M. Gerasimova, A. I. Nikishov, V. I. Zatsepin, B. A. Khrenov, L. I. Dorman, V. F. Tulinov, S. I. Syrovatskiy, V. M. Fedorov, Yu. N. Vavilov, and A. T. Abrosimov.

PURPOSE: This book is intended for physicists, astronomers and other scientists concerned with the earth's radiation belts and cosmic ray research.

COVERAGE: This is Volume 3 of a 4-volume work containing the proceedings of the Moscow Cosmic Ray Conference held July 6-11, 1959. This volume contains 40 reports on the earth's radiation belts and primary cosmic radiation. The reports delivered by Soviet scientists are abstracted below. References accompany individual reports.

III. THE ORIGIN OF COSMIC RAYS

33. Ginzburg, V.L. Some Aspects of the Theory of Cosmic Ray Origin 196-204
This paper elucidates the following problems: 1) The mean gas concentration in the galaxy (including the halo). 2) The role of different cosmic ray sources; the injection and particle acceleration mechanism in sources. 3) The mechanism and role of cosmic ray escape from the galactic halo into intergalactic space; the fraction of metagalactic cosmic rays in the Galaxy. 4) The nature of cosmic ray movement in the galactic spiral in connection with cosmic ray isotropy and chemical composition 5) The origin of the cosmic ray electron component in the halo.

34. Shklovskiy, I.S. Achievements in Radioastronomy and Radioastronomical Theory of the Origin of Cosmic Rays 205-210
This paper explains the radioastronomical theory of the origin of cosmic rays on the basis of the latest achievements in radioastronomy.

35. Kurchak, A.A., and S.I. Syrovatsky (Syrovatskiy). On the Composition of Primary Cosmic Rays 211-219
This paper points out the inadequacy in the explanations of the composition of cosmic rays and presents another approach to the solution of this problem.

39. Terletsky (Terletskiy), Y.P. Possible Acceleration of Charges by the Electromagnetic Field of the Magnetic Dipole of the Earth 233-238
This paper presents the results of new computations of the electromagnetic field of a rotating dipole, as well as of a corrected analysis of ion motion equations pertaining to this field. Questions regarding the divergence between computations in inertial and rotating systems of coordinates are considered, and general conclusions with regard to the nature of distribution of charges around a rotating dipole and with regard to analysis of possible currents are made.

40. ×Dorman, L.I. On the Initial State of Charged-Particle Acceleration 239-244
The author analyzes the following problems: 1) Injection energy in a solar flare in the case of charged-particle acceleration by the Fermi statistical mechanism. 2) Portion of accelerated particles and necessity of preliminary acceleration by the first order Fermi mechanism. 3) Acceleration of particles of the medium between approaching magnetic clouds: nonrelativistic Case, relativistic case, and the case of particle acceleration from very low energies to relativistic energies 4) Maximum energy of accelerated particles in various specific cases: compression of the plasma column under laboratory conditions and under conditions of solar flares, collision of magnetized clouds in interplanetary and in interstellar space, and collision of galaxies.

AVAILABLE: Library of Congress

(6)

SYROVATSKIY, S.I.

ZHDANOV, G.B., glav. red.; IVANENKO, I.P., pom. glav. red.; ZATSEPIN, V.I., red. toma; KHRENOV, V.A., pom. red. toma; GERASIMOVA, N.M., red.; NIKISHOV, A.I., red.; DORMAN, L.I., red.; TULINOV, V.F., red.; SYROVATSKIY, S.I., red.; FEDOROV, V.M., red.; VAVILOV, Yu.N., red.; ABROSIMOV, A.T., red.

Proceedings of the Moscow Cosmic Ray Conference, July 6-11, 1959. Moscow. Vol.2. Extensive air showers and cascades process. 1960. 331 p.
(No subject heading)

ZHDANOV, G.B., glav. red.; IVANENKO, I.P., pom. glav. red.; GERASIMOVA, N.M., red. toma; NIKISHOV, A.I., pom. red. toma; ZATSEPIN, V.I., red.; KHRENOV, V.A., red.; DORMAN, L.I., red.; TULINOV, V.F., red.; SYROVATSKIY, S.I., red.; FEDOROV, V.M., red.; VAVILOV, Yu.N., red.; ABROSIMOV, A.T., red.;

Proceedings of the Moscow Cosmic Ray Conference. July 6-11, 1959. Moscow. Vol.1. 1960. 333 p.
(No subject heading)

GERASIMOVA, N.M., otv.red.toma; NIKISHOV, A.I., zamestitel' red.toma; ZHDANOV, G.B., glavnyy red.; IVANENKO, I.P., zamestitel' glavnogo red.; ZATSEPIN, V.I., red.; KHRENOV, B.A., red.; DORMAN, L.I., red.; TULINOV, V.F., red.; SYROVATSKIY, S.I., red.; FEDOROV, V.M., red.; VAVILOV, Yu.N., red.; ABROSIMOV, A.T., red.; GUROV, K.P., red.izd-va; BRUZGUL', V.V., tekhn.red.

[Transactions of the International Conference on Cosmic Rays] Trudy Mezhdunarodnoi konferentsii po kosmicheskim lucham. Moskva, Izd-vo Akad.nauk SSSR. Vol.1. [Nuclear interactions at energies of 10^{11}-10^{14} ev.] IAdernye vzaimodeistviia pri energiiakh 10^{11}-10^{14} ev. 1960. 335 p. (MIRA 13:9)

1. Mezhdunarodnaya konferentsiya po kosmicheskim lucham. Moscow, 1959. (Nuclear reactions)

ZHDANOV, G.B., glavnyy red.; IVANENKO, I.P., zam.glavnogo red.; ZATSEPIN, V.I., otv.red.toma; KHRENOV, B.A., zam.red.toma; GERASIMOVA, N.M., red.; NIKISHOV, A.I., red.; DORMAN, L.I., red.; TULINOV, V.F., red.; SYROVATSKIY, S.I., red.; FEDOROV, V.M., red.; VAVILOV, Yu.N., red.; ABROSIMOV, A.T., red.; GUROV, K.P., red.izd-va; BERKGAUT, V.G., red.izd-va; BRUZGUL', V.V., tekhn.red.

[Extensive air showers and cascade processes] Shirokie atmosfernye livni i kaskadnye protsessy. Moskva, Izd-vo Akad.nauk SSSR, 1960. 351 p. (Trudy mezhdunarodnoy konferentsii po kosmicheskim lucham, no.2). (MIRA 13:12)

1. International Conference of Cosmic Radiation.
(Cosmic rays)

ZHDANOV, G.B., glavnyy red.; IVANENKO, I.P., zam.glavnogo red.; DORMAN, L.I., otv.red.toma; TULINOV, V.F., zam. redaktora toma; GERASIMOVA, N.M., red.; NIKISHEV, A.I., red.; ZATSEPIN, V.I., red.; KHRENOV, B.A., red.; SYROVATSKIY, S.I., red.; FEDOROV, V.M., red.; VAVILOV, Yu.N., red.; ABROSIMOV, A.T., red.; GUS'KOV, G.G., red.izd-va; BRUZGUL', V.V., tekhn.red.

[Transactions of the International Conference on Cosmic Rays] Trudy Mezhdunarodnoi konferentsii po kosmicheskim lucham. Moskva, Izd-vo Akad.nauk SSSR. Vol.4. [Variations in the intensity of cosmic rays] Variatsii intensivnosti kosmicheskikh luchei. 1960. 362 p. (MIRA 13:10)

1. Mezhdunarodnaya konferentsiya po kosmicheskim lucham. Moscow, 1959. 2. Magnitnaya laboratoriya AN SSSR, Moskva (for Dorman).
(Cosmic rays)

ZHDANOV, G.B., glav. red.; IVANENKO, I.P., pom. glav. red.; DORMAN, L.I., red. toma; TULINOV, V.F., pom. red. toma; GERASIMOVA, N.M., red.; NIKISHOV, A.I., red.; ZATSEPIN, V.I., red.; KHRENOV, V.A., red.; SYROVATSKIY, S.I., red.; FEDOROV, V.M., red.; VAVILOV, Yu.N., red.; ABROSIMOV, A.T., red.

Proceedings of the Moscow Cosmic Ray Conference, July 6-11, 1959. Moscow. Vol.14. Variations of cosmic-ray intensity. 1960. 365 p.

(No subject heading)

83771
S/056/60/039/003/027/045
B006/B063

10.8000 (new)
26.1410

AUTHORS: Sirotina, Ye. P., Syrovatskiy, S. I.

TITLE: The Structure of Low-intensity Shock Waves in Magnetohydrodynamics

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 39, No. 3(9), pp. 746-753

TEXT: The authors of the present paper investigated low-intensity shock waves by a method that was used by L. D. Landau and Ye. M. Lifshits to study shock waves in ordinary hydrodynamics, and was generalized by Syrovatskiy for the treatment of shock waves propagating perpendicular to a magnetic field in magnetohydrodynamics. Though this method cannot be used to study the specific features of strong shock waves, such as isothermal and isomagnetic jumps, it permits a general solution of the problem of any waves in consideration of dissipative processes. This is particularly important for the investigation of the dependence of the solution on the parameters and of the occurrence of singularities. The first section deals with the equations of low-intensity shock waves. The authors consider a plane shock wave in which all quantities are only functions of

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S/056/60/039/003/027/045
B006/B063

The Structure of Low-intensity Shock Waves in Magnetohydrodynamics

x. The general magnetohydrodynamic equations for a steady, uniform flow are written down. These equations along with the conditions for the occurring jumps of the parameters lead to the following differential equation for $p(x)$:

$$\left[1 + \left(j^2 + \frac{a_1}{2}\right)\left(\frac{\partial V}{\partial p}\right)_s\right]\delta p + \frac{1}{2}\left[\left(j^2 + \frac{a_1}{2}\right)\left(\frac{\partial^2 V}{\partial p^2}\right)_s + b_1\left(\frac{\partial V}{\partial p}\right)_s^2\right](\delta p)^2$$

$$= -\left\{\frac{j^2 + a_1/2}{T}\,\frac{\varkappa}{j}\left(\frac{\partial T}{\partial p}\right)_s\left(\frac{\partial V}{\partial s}\right)_p + \left[\frac{c_1}{2} - j\left(\frac{4}{3}\eta + \zeta\right)\left(\frac{\partial V}{\partial p}\right)_s\right]\right\}\frac{dp}{dx} \quad ; \quad \delta p = p(x) - p_1 \,.$$

(p, T, and V are the pressure, temperature, and specific volume, respectively, of the medium; η and ζ are the first and the second viscosity coefficient, respectively; $\varkappa$ is the coefficient of thermal conductivity; a_1, b_1, and c_1 are coefficients tending toward zero with $H \to 0$). First, this equation is used to study the attenuation of small-amplitude waves and to determine the attenuation factor (Section II), and later (Section III) it is used to determine the width of the discontinuity. The last part (Section IV) deals with the relationship between the attenuation factor

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S/053/60/071/03/02/008
B006/B063

3.1900

AUTHORS: Ginzburg, V. L., Syrovatskiy, S. I.

TITLE: The Present Stage of the Problem of the Origin of Cosmic Rays

PERIODICAL: Uspekhi fizicheskikh nauk, 1960, Vol. 71, No. 3, pp. 411-469

TEXT: The International Conference on Cosmic Radiation took place in Moscow in July, 1959. This review article contains a compilation and discussion of all known results, with special regard to the data obtained after this conference. The authors proceed from concepts based on radioastronomical data, according to which cosmic radiation mainly originates from Galaxies, and is due to eruptions of Supernovae and possibly other variable stars. § 1 is devoted to primary cosmic radiation on the Earth, its chemical composition being described first. Table 1 lists data on Z, A, flux, number of nucleons, flux- and particle number ratios. The energy spectrum is described next. In general,
$I_A(>\mathcal{E}) = K_A \mathcal{E}^{-\gamma+1}$ holds, where $I_A(>\mathcal{E})$ is the nuclear flux of group A with

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The Present Stage of the Problem of the Origin of Cosmic Rays

S/053/60/071/03/02/008
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a total energy (per nucleon) greater than $\mathcal{E}$. The values for K_A and γ are given in Table 2. Within the limits of error $\gamma = 2.5 \pm 0.2$. The differential spectrum exhibits a maximum with a steep decline, so that one may speak of a "cutoff". The origin of this "cutoff" and the fact that its energy is independent of the nuclear charge are discussed. The spectrum of the total energy per particle may be expressed by $I_A(>E) = K_A(E/A)^{-\gamma+1} = (K_A A^{\gamma-1})/E^{\gamma-1}$ (cf. Table 3). For $\simeq 10^{15}$ ev the spectrum has a singularity whose nature and cause are discussed in the following. § 2 gives a survey of radioastronomical data referring to synchrotron radiation, results and interpretation of some observations on the structure of the Galaxy and its sources of discrete radiation (galactic "halo" or "corona", "radio-disk" of the Galaxy (Figs. 1 and 2), and its "central radio range" (Figs. 3 and 4)). Data on power, energy, and magnetic field strength are given in Table 4 for numerous sources of galactic radiation. § 3 gives details on the lifetime of cosmic rays and their motion in the Galaxy and metagalaxy (the part played by cosmic rays formed in the early developmental stages of the Galaxy; the motion of cosmic particles in galactic magnetic fields,

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The Present Stage of the Problem of the Origin of Cosmic Rays

the radiation yield from the Galaxy; cosmic radiation of metagalactic origin; the origin of the electronic component of cosmic radiation in the interstellar space or in the envelopes of Supernovae). § 4 deals with the sources of cosmic radiation, mechanism of particle acceleration and chemical composition (radiation sources, mechanism of acceleration, energy spectrum, and the possibility of preferential acceleration of heavy nuclei; changes in the chemical composition of cosmic radiation in the interstellar space; chemical composition and distribution of elements in the radiation. The article is concluded with three additional remarks in the proof correction of this paper. Mention is made of G. A. Shayn, I. S. Shklovskiy, G. G. Getmantsev, V. A. Razin, and I. M. Gordon. There are 6 figures, 8 tables, and 144 references: 67 Soviet, 22 American, 1 Japanese, 2 German, 7 British, 14 Italian, 1 Belgian, 5 Australian, 1 French, 2 Dutch.

Card 3/3

GINZBURG, V.L.; SYROVATSKIY, S.I.

Origin of cosmic rays. Geomag. i aer. 1 no.4:479-482 Jl-Ag '61.
(MIRA 14:12)

1. Fizicheskiy institut imeni P.N. Lebedeva AN SSSR.
(Cosmic rays)

30820
S/033/61/038/005/008/015
E133/E435

3,1730 (1172)

AUTHORS: Korchak, A.A., Syrovatskiy, S.I.

TITLE: The polarization of radiation and magnetic field structure in cosmic sources of magnetic brake radiation

PERIODICAL: Astronomicheskiy zhurnal, v.38, no.5, 1961, 885-897

TEXT: The polarization produced by magnetic braking of relativistic particles is, in general, elliptical. Linear polarization results for an isotropic particle distribution. However, the degree of ellipticity introduced by anisotropy is usually small. A homogeneous magnetic field should produce a high degree of polarization (60 to 80%). The observed amount, however, does not exceed 10%. This could be due either to the inhomogeneity of the magnetic field or to the Faraday effect. This latter effect should vary rapidly with frequency, whereas the observed polarization does not seem to do so. It is therefore possible to connect the observed polarization with an inhomogeneous magnetic field. This can be done most conveniently by considering the field as consisting of two components: one homogeneous and the other completely random (average value zero). The authors first consider the brake

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The polarization of radiation ...

radiation produced by a charged particle moving in a homogeneous magnetic field (Ref.13: K.C.Westfold, Astrophys, J., v.130, 241, 1959). They thus obtain values for I_1 and I_2: the flux density at a distance r from a particle with components of oscillation parallel (I_1) and perpendicular (I_2) to the projection of the magnetic field (H) on the celestial sphere. They next consider a system of particles, instead of a single particle, and derive the Stoke's parameters (confined to a homogeneous isotropic distribution of particles). These are given by the set of equations

$$I = \frac{\sqrt{3}}{4\pi r^2}\frac{e^3}{mc^2}\int H \sin\mu dv \int N(E)\, dE \frac{\nu}{\nu_c}\int_{\frac{\nu}{\nu_c}}^{\infty} K_{5/3}(\eta)\, d\eta,$$

$$Q = \frac{\sqrt{3}}{4\pi r^2}\frac{e^3}{mc^2}\int H \sin\mu \cos 2\chi\, dv \int N(E) dE \frac{\nu}{\nu_c} K_{5/3}\left(\frac{\nu}{\nu_c}\right), \qquad (12)$$

$$U = \frac{\sqrt{3}}{4\pi r^2}\frac{e^3}{mc^2}\int H \sin\mu \sin 2\chi\, dv \int N(E) dE \frac{\nu}{\nu_c} K_{5/3}\left(\frac{\nu}{\nu_c}\right),$$

$$V = 0.$$

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The polarization of radiation ...

The fact that $V = 0$ indicates that the radiation is linearly polarized. The amount of ellipticity introduced by an anisotropic distribution is small, because $V \cong mc^2/E$. It is assumed that the electronic energy spectrum is given by

$$N(E)dE = KE^{-\gamma}dE(E_1 < E < E_2) \quad (15)$$

The equations for the Stoke's parameters can then be transformed to

$$I = \frac{\gamma + 7/3}{\gamma + 1} \Phi(\nu, \gamma) \int_v [H \sin \mu]^{(\gamma+1)/2} dv,$$

$$Q = \Phi(\nu, \gamma) \int_v [H \sin \mu]^{(\gamma+1)/2} \cos 2\chi \, dv,$$

$$U = \Phi(\nu, \gamma) \int_v [H \sin \mu)^{(\gamma+1)/2} \sin 2\chi \, dv, \quad (18)$$

Card 3/5

The polarization of radiation ...

This set of equations would allow the determination of the intensity and polarization distribution, if the magnitude and distribution of the magnetic field were known. Two simple cases are considered: (a) an anisotropic field of constant magnitude; the field is assumed to be axially symmetric and representable by a series of zonal harmonics; (b) a superposition of a homogeneous and a chaotic field. The degree of polarization is given by

$$p = \left| \frac{\langle \Delta H^2 \rangle}{\langle H^2 \rangle} \right| f(\gamma), \tag{35}$$

$$f(\gamma) = \frac{45}{8} \frac{(\gamma+1)(\gamma+5)}{(\gamma+7)(3\gamma+7)} \tag{36}$$

for case (a) and by

$$\frac{3(\gamma+1)(\gamma+3)(\gamma+5)}{32(3\gamma+7)} \left[1 - \frac{\gamma^2+8\gamma+3}{24} \frac{H_1^2}{H_1^2} \right] \frac{H_1^2}{H_1^2}; \tag{37}$$

$$p = \frac{3(\gamma+1)}{3\gamma+7} \left(1 - \frac{2}{3} \frac{H_1^2}{H_1^2} \right). \tag{38}$$

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25198
S/056/61/040/006/019/031
B108/B209

3.2410

AUTHOR: Syrovatskiy, S. I.

TITLE: Spectrum of galactic and solar cosmic rays

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 40, no. 6, 1961, 1788 - 1793

TEXT: The author presents simple considerations showing that the spectrum of galactic and solar cosmic rays may, on certain assumptions, be obtained from the general thermodynamic requirements. An important result is the equidistribution of energy between the kinetic energy of gas masses, the magnetic energy, and the energy of relativistic particles (Ref. 5: V. L. Ginzburg. UFN, 51, 343, 1953; 62, 37, 1957). Magnetized gas clouds are assumed to attain a state of equilibrium after a relatively short time, in which $W_{c.r.} = W_{turb} = W_{mag} = W/3$ (3), where W is the total energy of the cloud consisting of the energy of cosmic rays $W_{c.r.}$, the energy of turbulent motion of the gas W_{turb}, and the energy of the magnetic field W_{mag}. The decrease in energy of the cloud is assumed to

Spectrum of galactic...

be chiefly due to leakage of relativistic particles. This leakage may be due to diffusion of relativistic particles toward the boundary of the cloud as well as to the emission of "bunches" of cosmic rays as a consequence of ruptures of the magnetic field at the boundaries of the cloud. In this case, the energy-balance equation has the form $dW \equiv d(3n\bar{E}_k) = \bar{E}_k dn$ (4), where n is the number of relativistic particles in the nebula, and $\bar{E}_k$ their mean kinetic energy. For ultrarelativistic energies, the number of cosmic-ray particles in the cloud and their mean energy are interrelated by the equation $n = \text{const.}\bar{E}^{-1.5}$ (5). The differential spectrum of the particles leaving the cloud has the form $N(E)dE = -dn = \text{const.} E^{-2.5}dE$ (6), which is in good accordance with observations of galactic cosmic rays. Unlike galactic gas clouds, the contribution of cosmic rays from the solar chromosphere cannot be calculated by energy isolations. Considering the internal pressure, which is due to the strong magnetic field in the solar chromosphere near sunspots and causes solar flares, the thermodynamic relation $dH = \bar{E}_k dn$ (7) may be used to describe the cavities forming in the solar chromosphere through acceleration processes.

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Spectrum of galactic...

H denotes the heat function of the system, n the number of particles in a cavity, and E_k their mean energy. The gas of the cosmic rays may be considered to be a perfect gas with a constant ratio of the specific heats, $\varkappa$. From this it follows that the spectrum of particles ejected from a cavity has the form $N(E_k)dE_k = -dn = \text{const}\cdot E_k^{-\gamma}$ ($\gamma > 0$), where $\gamma = (2\varkappa-1)/(\varkappa-1)$ (11). If a constant pressure is assumed during ejection, an exponent of $\gamma = 3.5$ is obtained for nonrelativistic cosmic rays and an exponent of $\gamma = 5$ for ultrarelativistic rays. There are 11 references: 10 Soviet-bloc and 1 non-Soviet-bloc. The three references to English-language publications read as follows: E. Fermi, Phys. Rev. 75, 1169, 1949; P. Morrison, S. Olbert, B. Rossi, Phys. Rev. 94, 440, 1954; E. N. Parker, Phys. Rev., 99, 1335, 1955.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: January 4, 196

Card 3/3

KARDASHEV, N.S.; KUZ'MIN, A.D.; SYROVATSKIY, S.I.

Nature of the emission of radio galaxy Cygnus-A. Astron.zhur. 39 no.2:216-221 Mr-Ap '62. (MIRA 15:3)

1. Gosudarstvennyy astronomicheskiy institut im. P.K.Shternberga i Fizicheskiy institut im. P.N.Lebedeva AN SSSR.
(Galaxies) (Radio astronomy)

4354
S/033/62/039/006/007/024
E032/E114

24.6710

AUTHOR: Syrovatskiy, S.I.

TITLE: On the stability of plasma in a non-uniform magnetic field and the mechanism of solar flares

PERIODICAL: Astronomicheskiy zhurnal, v.39, no.6, 1962, 987-989

TEXT: It is noted that according to A.B. Severnyy (Astron. zh. v.35, 1958, 335; and Izv. Krymskoy astrofiz. observ., v.20, 1958, 22) the instability of a current layer in plasma may lead to the spontaneous contraction of the plasma near the neutral point ($H = 0$). This is the basis of the theory of chromospheric flares developed by A.B. Severnyy, and is now said to be frequently confused with the pinch effect. The instability is deduced from the assumption that the magnetic pressure in adiabatic contraction increases as the square of the plasma density, while the gas pressure is proportional to ρ^{γ} where γ is always less than 2. It is now argued that the difference in the laws of increase of the two pressures cannot give rise to a spontaneous contraction since the dynamic behaviour of the medium is determined not by the pressure but by the pressure gradient. It follows that the above

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assumption of Severnyy's theory must be re-formulated in terms of the magnetic-pressure and gas-pressure gradients, in which case the equilibrium condition

$$\frac{\partial}{\partial x}\left(p + \frac{H^2}{8\pi}\right) = 0 \qquad (1)$$

can only be satisfied as a matter of chance. This assumption is now shown to be incorrect. It is noted that the Severnyy system is analogous to a spring with a variable rigidity. It is clear that such a spring will exhibit a variable compression which will be directly related to the rigidity of the spring. However, in Severnyy's theory the compression is assumed to be uniform at the outset and the departure from equilibrium which results from this artificial assumption is interpreted as an instability of the system. This is said to be the fundamental error in Severnyy's theory.

ASSOCIATION: Fizicheskiy in-t im. P.N. Lebedeva Akademii nauk SSSR (Physics Institute imeni P.N. Lebedev, AS USSR)

Card 2/2

SUBMITTED: April 20, 1962

GINZBURG, S. I. SYROVATSKIY

Origin of cosmic rays

Report submitted for the 8th Intl. Conf. on Cosmic Rays (IUPAP), Jaipur India, 2-14 Dec 1963

. . GINZBURG, S. I. SYROVATSKIY

On the Cosmic Gamma and X-Radiation connected with the Galactic and Metagalactic Cosmic Rays.

report submitted for the 8th Intl. Conf. on Cosmic Rays (IUPAP), Jaipur India, 9-14 Dec 1963

GINZBURG, Vitaliy Lazarevich; SYROVATSKIY, Sergey Ivanovich; TOL'SKIY, D.A., red. izd-va; KOSHINA, P.S., tekhn. red.

[Origin of cosmic rays] Proiskhozhdenie kosmicheskikh luchei. Moskva, Izd-vo Akad. nauk SSSR, 1963. 384 p. (MIRA 16:6)
(Cosmic rays)

GINZBURG, V.L.; OZERNOY, L.M.; SYROVATSKIY, S.I.

Mechanism of the emission of galaxy 3C 273-B. Astron.tsir. no.267:1-4 O '63. (MIRA 17:4)

1. Fizicheskiy institut imeni P.N.Lebedeva AN SSSR.

ACCESSION NR: AT4042278 S/0000/63/003/000/0017/0022

AUTHOR: Sy*rovatskiy, S. I., Chesalin, L. S.

TITLE: Electromagnetic excitation of a conducting fluid flow near bodies and the exclusion force.

SOURCE: Soveshchaniye po teoreticheskoy i prikladnoy magnitnoy gidrodinamike. 3d, Riga, 1962. Voprosy* magnitnoy gidrodinamiki (Problems in magnetic hydrodynamics); doklady* soveshchaniya, v. 3. Riga, Izd-vo AN LatSSR, 1963, 17-22

TOPIC TAGS: turbulent flow, conducting fluid flow, electromagnetic flow excitation, exclusion force, infinite cylinder problem, sphere problem, arbitrary field orientation, hydromagnetics

ABSTRACT: The authors present a simple method for solving problems on the turbulent flow of a conducting fluid and the forces acting on bodies placed in the flow, where the conductivity of flow and body are not equal. The basic problem involves flow of an incompressible fluid, and the summary forces acting on a body in it are expressed as

$$F = \int_{\Sigma} p n dS - \int_{\Sigma} \sigma'_n dS + \frac{1}{c} \int_{V} [j_1 h] dV, \quad (1)$$

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ACCESSION NR: AT4042278

where p = pressure, j = current density, v = velocity, h = magnetic field, n = inside normal to surface, $\sigma'_n = \{\sigma'_{ik} n_k\}$ and σ'_{ik} = viscous stress tensor. The solution is then exemplified for an infinite cylinder, arbitrarily oriented in relation to current density and magnetic field, and for a sphere. Orig. art. has: 30 equations.

ASSOCIATION: none

SUBMITTED: 04Dec63 ENCL: 00

SUB CODE: ME NO REF SOV: 001 OTHER: 001

Card 2/2

SYROVATSKIY, S. I.

AID Nr. 963-11 10 May

ELECTROMAGNETIC EJECTION OF A SPHERICAL BODY FROM A CONDUCTING LIQUID (USSR)

Andres, U. Ts., L. S. Polak, and S. I. Syrovatskiy. Zhurnal tekhnicheskoy fiziki, v. 33, no. 3, Mar 1963, 263-267. S/057/63/033/003/002/021

A theoretical and experimental study has been carried out to determine the electromagnetic force exerted on a spherical body immersed in a conducting liquid in a magnetic field. In the theoretical part MHD relationships are used to derive a general formula for this force and a dimensionless parameter R, which equals Reynolds number Re when Re is small and Re^2 when it is large. The formula can be solved precisely for $R \ll 1$, while experimental determination of the function $\Phi(R)$ which appears in the formula is necessary for $R \gg 1$. In the experimental part direct measurements were made of the force exerted on a nonconducting ball with a diameter of 1.2 cm immersed in a rectilinear container of organic glass filled

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AID Nr. 963-11 10 May S/057/63/033/003/002/021

ELECTROMAGNETIC EJECTION [Cont'd]

with a current-conducting water solution of NaOH and glycerin placed between the poles of a magnet with a field strength of 2000 to 5000 gauss. The conductivity and viscosity of the solution were varied by changing the NaOH and glycerin concentrations, respectively. The buoyant force exerted on the ball was measured by deformation of a quartz spiral from which the ball was suspended. Results obtained for $R > 10^2$ show that at low R values the flow of liquid around the ball leads to a decrease of buoyant force with respect to the force in an unperturbed liquid. With increased R the magnitude of the buoyant force increases. Attempts to measure the force on a conducting (steel) ball failed, owing to the formation of gas bubbles on its surface, which varied its conductivity irregularly.

[BB]

Card 2/2

L 11191-63 EWT(l)/FCC(w)/BDS/ES(v)--AFFTC/ASD/ESD-3/APGC/SSD--
Pe-4/Pi-4 S/0033/63/040/003/0466/0476
ACCESSION NR: AP3001240

69
67

AUTHOR: Ginzburg, V.L.; Syrovatskiy, S.I.

TITLE: On cosmic rays in metagalactic space

SOURCE: Astronomicheskiy zhurnal, v. 40, no. 3, 1963, 466-476

TOPIC TAGS: cosmic rays, metagalactic cosmic rays, galactic cosmic rays, electron component cosmic rays, metagalactic radio emission, metagalactic gamma emission, cosmology

ABSTRACT: This theoretical discussion attempts an assessment of the possible energy density of cosmic rays in metagalactic (MG) space within the framework of evolutional cosmology. In all probability, the energy density of MG cosmic rays is substantially smaller than that of galactic (G) cosmic rays; the latter approximates 10-sup-minus-12 erg/cc. The best possible estimate for the energy density of MG cosmic rays, at this time, approximates 10-sup-minus-15 to 10-sup-minus-16 erg/cc. The energy density of MG thermal radiation is estimated at 10-sup-minus-15 erg/cc or 10-sup-minus-3 eV/cc. A discussion is also given of models in which the MG cosmic-ray energy density is comparable with that of G cosmic rays only within the limits of a local supergalaxy or a local group of

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L 11191-63
ACCESSION NR: AP3001240

2

galaxies. Such models may provide an explanation for the measured cosmic-ray intensities in the Galaxy only if a large number of far-reaching supplementary assumptions are made, all of which appear to have a low probability. By contrast, the galactic theory of the origin of the major portion of the cosmic rays observed on Earth does not encounter any serious objections. The paper discusses also a number of problems of the electron component of cosmic rays and radio emission and gamma emission of MG origin. There are 14 numbered equations.

ASSOCIATION: Fizicheskiy in-t (Physics Institute nauk SSSR, imeni P.N.Lebedevol, Akademii Academy of Sciences, SSSR)

SUBMITTED: 30Oct62 DATE ACQD: 01Jul63 ENCL: 00

SUB CODE: AS, PH NO REF SOV: 008 OTHER: 009

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Card 2/2

L 52206-65 EWT(l)/EWG(v)/FCC/EEC-4/EEC(t)/EWA(h) Pc-4/Pe-5/Pq-4/Pae-2/Peb/Pi-4 GW

ACCESSION NR: AP5017044 UR/0048/64/028/012/1910/1921 51 50 B

AUTHOR: Ginzburg, V. L.; Syrovatskiy, S. I.

TITLE: Origin of cosmic rays / Report of the All-Union Conference for the Physics of Cosmic Rays, held in Moscow, 4-10 October, 1963 /

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 28, no. 12, 1964, 1910-1921

TOPIC TAGS: cosmic ray, galactic radiation, space radiation, galaxy, metal-galaxy, astrophysics

ABSTRACT: The article presents a review of the current state of the problem of the origin of cosmic rays. It is based on work completed since the last conference on the subject held in Japan in 1961. This paper is not as broad in scope as the survey paper delivered by the authors at the Japan conference but is limited to the following fields: metagalactic cosmic rays, metagalactic and "extended" galactic theory of the origin of cosmic rays, galactic theory of the origin of cosmic rays and the explosion of galactic cores, the nature of electrons responsible for galactic radio emissions, high energy electrons, and gamma radiation associated with galactic and metagalactic cosmic rays. The

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L 52206-65

ACCESSION NR: AP5017044

authors suggest that this field should be called "astrophysics of cosmic rays" rather than "origin of cosmic rays".

Orig art has: 15 formulas, 4 graphs, 2 tables

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 00 ENCL: 00 SUB CODE: AA, NP

NO REF SOV: 011 OTHER: 020 JPRS

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Card 2/2

L 52205-65 EWT(l)/EWG(v)/FCC/EEC-4/EEC(t)/EWA(h) Pc-4/Pe-5/Pq-4/Pae-2/Peb/Pi-4
GW

ACCESION NR: AP5017045 UR/0048/64/028/012/1922/1925

54
53
B

AUTHOR: Ginzburg, V. L.; Syrovatskiy, S. I.

TITLE: Gamma- and x-radiation associated with galactic and metalgalactic cosmic rays [Report of the All-Union Conference for the Physics of Cosmic Rays, held in Moscow, 4-10 October, 1963]

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 28, no. 12, 1964, 1922-1925

TOPIC TAGS: gamma ray, x ray, space radiation, cosmic ray, galactic radiation, astrophysics

ABSTRACT: Since gamma rays with energies greater than 5.10^7 ev can be generated only by cosmic rays, the following processes are discussed in the article: the decay of π^0-mesons during collisions of cosmic rays in a gas; bremsstrahlung of the relativistic electrons and positrons comprising the electron component of cosmic rays; scattering of particles of the electron component by thermal photons; and magnetostrictive X-radiation. The authors note that earlier papers on gamma and X-radiation accompanying cosmic rays differ in their results by several orders of magnitude. They have therefore recalculated

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L 52205-65

ACCESSION NR: AP5017045

the above effects using data from their own research published in five previous papers.

Orig. art. has: 15 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 00	ENCL: 00	SUB CODE: AA, NP
NO REF SOV: 009	OTHER: 009	JPRS

Card 2/2

GINZBURG, V.L.; SYROVATSKIY, S.I.

Secondary electron component of cosmic rays and the spectrum of general galactic radio emission. Astron. zhur. 41 no.3: 430-445 My-Je '64. (MIRA 17:6)

1. Fizicheskiy institut im. P.N. Lebedeva AN SSSR.

L 17210-63 EWT(l)/EWT(m)/FCC(w)/BDS/ES(v) AFFTC/ASD/ESD-3 Pe-4

ACCESSION NR: AP3005293 S/0056/63/045/002/0353/0363

64
63

AUTHORS: Ginzburg, V. L.; Sy*rovatskiy, S. I.

TITLE: Gamma ray and cyclotron radiation X-rays of galactic and metagalactic origin

SOURCE: Zhur. eksper. i teoret. fiz., v. 45, no. 2, 1963, 353-363

TOPIC TAGS: galactic X-ray , galactic gamma ray , metagalactic X-ray , metagalactic gamma ray , cyclotron radiation, pion decay

ABSTRACT: The question of the intensity of gamma and X-rays produced as a result of nuclear interaction of cosmic rays in the galaxy and metagalaxy is discussed, and the intensity of the gamma rays due to the decay of neutral pions produced in such interactions is computed. The intensity of the X-rays due to the cyclotron radiation of the electrons (or positrons) produced by decay of positive and negative pions is calculated for the same conditions. The expected

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L 17210-63

ACCESSION NR: AP3005293

X-ray intensities (on the order of 2.6×10^{-4} quantum/cm^{2}sec.sr) is much smaller than the value obtained in several investigations (about 2 photons/cm^{2}sec.sr). The expected gamma-ray intensities are likewise several orders of magnitude smaller than would follow from results by others. It is concluded that interstellar space does not contain enough high-energy primary electrons to be able to attribute the observed fluxes to cyclotron radiation; such electrons could come from supernova shells. Orig. art. has 43 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 19Feb63 DATE ACQ: 19Feb63 ENCL: 00

SUB CODE: PH NO REF SOV: 008 OTHER: 011

Card 2/2

SYROVATSKIY, S.I.; FOMIN, Yu.A.; KHRISTIANSEN, G.B.

Energy spectrum of primary cosmic radiation and its composition in the region of ultrahigh energies. Zhur. eksp. i teor. fiz. 45 no.5:1595-1602 N '63. (MIRA 17:1)

1. Fizicheskiy institut imeni Lebedeva AN SSSR i Institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta.

ACCESSION NR: AP4037602 S/0056/64/046/005/1865/1879

AUTHOR: Ginzburg, V. L.; Sy*rovatskiy, S. I.

TITLE: Gamma and x-ray radiation associated with galactic and metagalactic cosmic rays

SOURCE: Zh. eksper. i teor. fiz., v. 46, no. 5, 1964, 1865-1879

TOPIC TAGS: gamma ray, x-ray, cosmic ray, galactic cosmic ray, relativistic electron, interstellar gas, intergalactic gas

ABSTRACT: The intensity of γ-rays produced as a result of various interaction processes between cosmic rays (including the electron component) and the interstellar and intergalactic gas, or between cosmic rays and thermal radiation is calculated. It is shown that the main contribution to the γ-ray intensity is from the scattering of relativistic electrons by thermal photons, although γ-rays from the decay of π^0-mesons and electron bremsstrahlung may also be important. Comparison of calculations with experimental data indicates

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L 19047-65 EWG(j)/EWT(l)/EWT(m)/EWG(v)/FCC/EEC-4/EEC(t)/T/EWA(h) Pe-5/Pi-4/Po-4/Pq-4/Pae-2/Peb/Pb-4 IJP(c)/AFWL/SSD/AFETR/ASD(a)-5/ASD(f)-2/AFMDC/ESD(t) GW/WS

ACCESSION NR: AP5000368 S/0053/64/084/002/0201/0242

AUTHOR: Ginzburg, V. L.; Sy*rovatskiy, S. I.

TITLE: Some problems in gamma and x-ray astronomy

SOURCE: Uspekhi fizicheskikh nauk, v. 84, no. 2, 1964, 201-242

TOPIC TAGS: cosmic radiation composition, cosmic ray, cosmic ray particle, x ray astronomy, gamma astronomy, galactic radiation, metagalactic radiation

ABSTRACT: The authors discuss various mechanisms for the production of gamma rays in the galaxy and metagalaxy and efficiencies of these mechanisms. Principal attention is paid to gamma rays generated by cosmic rays. The converse problem, that of obtaining information on cosmic rays from measurements of the intensity and spectrum of the metagalactic gamma rays, is also discussed. The study of x-ray astronomy is limited exclusively to cosmic rays, namely to the question whether cosmic rays contribute to the intensity of the x-rays arriving on earth from outer space. The existence of particles of low energy (less than 10^8 eV) capable of generating the extraterrestrial x-rays is discussed.

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L 19047-65
ACCESSION NR: AP5000368

The section headings are: 1. Radiation mechanisms. 1.1. Processes leading to the production of gamma and x-rays. 1.2. General expressions for the radiation intensity. 2. Cosmic rays, matter, and thermal radiation in the universe. 2.1. Intensity of cosmic rays. 2.2. Electronic component of cosmic rays. 2.3. Matter and thermal radiation in the galaxy and metagalaxy. 3. Cosmic gamma radiation (calculation of intensity). 3.1. Production of neutral pions and "pionic" gamma rays. 3.2. Bremsstrahlung. 3.3. Compton gamma rays. 3.4. Positron annihilation. 3.5. Nuclear gamma rays. 3.6. Absorption of gamma and x-rays. 4. Cosmic gamma rays (discussion). 4.1. Intensity of over-all cosmic gamma radiation. 4.2. Gamma radiation of discrete sources. 4.3. Experimental data, their discussion, and certain conclusions. 5. X-radiation connected with cosmic rays. 5.1. Cyclotron x-radiation. 5.2. X-radiation due to other processes. 5.3. Comparison of calculations with observations. Conclusion. Orig. art. has: 101 formulas and 4 tables.

ASSOCIATION: none

SUBMITTED: 00	ENCL: 00	SUB CODE: NP, AA
NO REF SOV: 028	OTHER: 052	ATD PRESS: 3157

Card 2/2

ACCESSION NR: AP4013323 S/0020/64/154/003/0557/0560

AUTHORS: Ginzburg, V.L. (Corresponding member); Ozernoy, L.M.; Sy*rovatskiy, S.I.

TITLE: On the radiation mechanism of galaxy 3C 273-B

SOURCE: AN SSSR. Doklady*, v. 154, no. 3, 1964, 557-560

TOPIC TAGS: extragalactic, radiation source 3C 273-B, metegalactic object, optical radiation, bremsstralung, luminosity, Compton loss, free-free transition, bound-free transition, relativistic electron, photon, visible frequency

ABSTRACT: The extragalactic radiation source 3C 273-B, identified as an emissive star-shaped object of the 12th magnitude (M. Schmidt, Nature, 197, 1040/1963/), is one of the recently discovered new types of metagalactic objects. The exceptionally high luminosity and irregular changes in the brillance of that galaxy are indicative of an unusual nature of the radiating object. The latter is

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ACCESSION NR: AP4013323

probably a "super star" rather than a cluster of stars, but the word "galaxy" is used here for want of a better term. It would be interesting to find out whether the continuous optical radiation from the galaxy 3C 273-B is due to magnetic bremsstralung. The optical radiation of galaxy 3C 273-B is not polarized, and could therefore easily be characterized also as non-magnetic bremsstralung. A contrary assumption would of course be wrong inasmuch as magnetic bremsstralung can, for a number of reasons, be completely depolarized. If the radiation from the object is of a braking nature (free-free and bound-free transitions), it cannot be considered as black body radiation in view of its spectral characteristics. Although the possibility of the bremsstralung nature of the mentioned radiation is not excluded, the spectrum of the other star-shaped extragalactic sources makes such a hypothesis considerably less probable (in the opinion of I. Shlovskiy). Orig. art. has: 11 formulas and 1 table.

ASSOCIATION: Fizicheskiy institut im. P.N. Lebedeva Akademii nauk

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ACCESSION NR: AP4013323

SSSR (The P.N. Lebedev Physics Institute, Academy of Sciences SSSR)

SUBMITTED: 10Oct63 DATE ACQ: 26Feb64 ENCL: 00

SUB CODE: PH NO REF SOV: 002 OTHER: 009

Card 3/3

L 12053-65 EWT(l)/EWG(v)/EEC-4/FCC/EEC(t)/EWA(h) Po-4/Pe-5/Pq-4/Pi-4/Pae-2/
Peb ASD(a)-5/AFWL/RAEM(c)/ESD(t) GW/WS

ACCESSION NR: AP4047317 S/0020/64/158/004/0808/0810

AUTHOR: Ginzburg, V. L. (Corresponding member AN SSSR); Sy*rovatskiy, S. I.

TITLE: Discrete sources of x-radiation

SOURCE: AN SSSR. Doklady*, v. 158, no. 4, 1964, 808-810 B

TOPIC TAGS: cosmic x radiation, discrete source, magnetobremsstrahlung, relativistic electron, magnetic field, electron spectrum, collapsed star, neutron star

ABSTRACT: Recently, x-radiation of cosmic origin was detected. The discrete sources of this radiation are unknown. V. L. Ginzburg and S. I. Syrovatskiy have proposed a hypothesis about the source of cosmic x-radiation. Both authors consider the source as emitting magnetobremsstrahlung from a volume filled with relativistic electrons. The intensity of the magnetic field in one small part of this volume attains a very high strength, which favors the occurrence of magnetobremsstrahlung. A formula was developed which expresses the magnetobremsstrahlung flux. Another formula represents the ratio of two

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ACCESSION NR: AP4047317

fluxes from different parts of the emitting volume where the electron spectra differ and the difference is characterized by a coefficient. The size of the emitting volumetric part is determined with assumed numerical values for the electron energy and the intensity of the magnetic field. Strong magnetic fields may exist only in parts of collapsed stars as neutron stars. Orig. art. has: 4 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics, AN SSSR)

SUBMITTED: 10Jul64 ATD PRESS: 3120 ENCL: 00

SUB CODE: AA NO REF SOV: 005 OTHER: 004

Card 2/2

L 2326-66 EWT(l)/FCC/EWA(h) GS/GW
ACCESSION NR: AT5023626 UR/0000/65/000/000/0486/0501

AUTHORS: Ginzburg, V. L.; Kurnosova, L. V.; Razorenov, L. A.; Syrovatskiy, S. I.; Fradkin, M. I.

TITLE: Some problems and perspectives in the investigation of primary cosmic rays

SOURCE: Vsesoyuznaya konferentsiya po fizike kosmicheskogo prostranstva. Moscow, 1965. Issledovaniya kosmicheskogo prostranstva (Space research); trudy konferentsii. Moscow, Izd-vo Nauka, 1965, 486-501

TOPIC TAGS: cosmic ray, gamma ray, x ray, solar activity, antiparticle

ABSTRACT: Problems associated with the investigation of primary cosmic rays and gamma rays are presented in a three-part report. Part I deals with the proton-nucleus component of the cosmic rays, Part II covers the electron-positron component, and Part III discusses cosmic gamma- and x-rays. Although the proton-nucleus component of primary cosmic rays has been studied quite completely, a group of problems still remains unanswered. Eight such problems discussed in Part I are: 1) energetic spectra of protons and nuclei in the energy interval below 100 Mev/nucleon. These spectra are represented by the form $N(E) \sim E^{1.8}$. 2) The relationship between fluxes of different nuclei groups (L, M, H) in the energy range 55 to 550 Mev/nucleon, which is still not well known. 3) Isotopic components of primary

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cosmic rays. This would require the measurement of three independent parameters such as dE/dx, E, and pc. 4) The presence of high speed antiprotons generated by the interaction of cosmic rays with interstellar media. Some measurements place the percent composition of antiparticles at 0.23%. 5) The verification of the presence of superheavy nuclei, Z > 30. 6) Estimates of the time rate of change of the fluxes in primary nuclei components which have their origin either in solar bursts or in modulated galactic cosmic rays. These intensity variations should be recorded continuously, outside the terrestrial atmosphere. 7) Intensity gradients of cosmic rays in the solar system as evidenced by data from Pioneer-5 and Mariner-1. 8) Anisotropy among particle fluxes of low, near-threshold energies. Two similar problems are discussed in Part II. Here the flux and energy spectra of primary cosmic ray electron-positron components are analyzed first, where data are shown to be rather scant. Next, the relationship between positron and electron fluxes is considered by measuring the charge composition of the primary cosmic rays. In Part III, calculation results of expected γ- and x-ray intensities from important galactic sources are considered. The γ-ray generation is attributed to processes such as π^0-meson decay, bremsstrahlung radiation of relativistic electrons and positrons, and Compton γ-rays by the scattering of photons on x-ray electrons. Experiments indicate $I_\gamma (> 50 \text{ Mev}) \leq 3.5 \times 10^{-4}$ photons/cm^2/sec/stere which is larger than expected galactic estimates. This then implies γ-rays of

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L 2326-66
ACCESSION NR: AT5023626 O

meta-galactic origin. For lower energies (0.51 Mev) I_γ = 1.2 to 300 x 10^{-6} photons/cm^2/sec/stere. Orig. art. has: 6 tables, 2 figures, and 4 formulas. [04]

ASSOCIATION: none

SUBMITTED: 02Sep65 ENCL: 00 SUB CODE: AA, NP

NO REF SOV: 020 OTHER: 046 ATD PRESS: 4101

Card 3/3

L 6946-66 EWT(1)/FCC/EWA(h) GW

ACC NR: AP 5026225 SOURCE CODE: UR/0048/65/029/010/1819/1824

AUTHOR: Ginzburg, V.L.; Syrovatskiy, S.I. 29 B

ORG: Physics Institute im. P.N.Lebedev, Academy of Sciences, SSSR (Fizicheskiy institut Akademii nauk SSR)

TITLE: Fundamental problems in cosmic ray astrophysics /Report, All-Union Conference on Cosmic Ray Physics held at Apatity, 24-31 August 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v.29, no.10, 965, 1819-1824

TOPIC TAGS: Primary cosmic ray, galaxy, cosmology, astrophysics

ABSTRACT: Recent literature on the astrophysical aspects of cosmic ray physics is reviewed and some related questions, particularly that of the origin of cosmic rays, are discussed. Advances in astronomy and radioastronomy in the past decade have attracted attention to the possible cosmological significance of cosmic rays. Cosmic rays, for example, might serve as a mechanism for carrying off the energy released in the gravitational collapse of stars or galaxies. There is convincing evidence that the energy density of cosmic rays is much less in metagalactic space than in our Galaxy. Arguments to the contrary by G.R.Burbidge and F. Hoyle (Proc.Phys.Soc., 84 141 (1964) are specifically criticized. Most of the galactic cosmic rays, therefore, must be of galactic origin. The electron component of the primary cosmic radiation has been shown to arise mainly from the direct acceleration of electrons rather than

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L 6946-66

ACC NR: AP 5026225

from meson decay. The stationary model of cosmic ray origin given by the authors (Proiskhozhdeniye kosmicheskikh luchey, Izd. AN SSSR, 1963), according to which most cosmic rays originate in supernovae, has not encountered any difficulties but cannot be regarded as proved. There is no convincing evidence that an explosion of the nucleus of our Galaxy has occurred in the past 10^9 years. The explosions observed in M82 and NGC 5128 do not indicate that such explosions are probable in our Galaxy, for M 82 and NGC 5128 are not spirals and differ considerably from our Galaxy. It has been argued that if all cosmic rays originated simultaneously, the relativistic particles would have travelled farther and encountered more interstellar matter than the low-energy particles, and would therefore contain a larger fraction of light nuclei, whereas such observational evidence as exists indicates that the higher energy socmic rays have a smaller fraction of light nuclei. This argument is not decisive, however, because the high-energy cosmic rays may have travelled through regions in which the density of interstellar matter is less than in those through which the low-energy cosmic rays passed. It may be possible soon to determine whether the cosmic ray intensity was significantly greater some 10^8 years ago than now by investigating meteorites as proposed by the authors (Proc. Internat. Conf. Cosmic Rays,Jaipur, 3 301 (1964); Izv. AN SSSR. Ser.fiz.,28,1910 (1964); Astron.zh. 41,430 (1964). Although the authors do not see any real arguments in favor of a non-stationary model for the origin of cosmic rays in the Galaxy,they agree that further investigation of this matter is justified. Orig.art. has 2 formulas and 1 table

SUB CODE: AA SUBM DATE: 00/--Oct65 ORIG.REF: 012 OTH REF: 007

Card 2/2

L 25773-66 - EWT(1) GW

ACC NR: AP6016379 SOURCE CODE: UR/0048/65/029/010/1825/1829

AUTHOR: Ginzburg, V. L.; Ozernoy, L. M.; Syrovatskiy, S. I. 34 B

ORG: Physics Institute im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR)

TITLE: Relativistic electrons in the M82 galaxy 12

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 10, 1965, 1825-1829

TOPIC TAGS: galaxy, relativistic electron, hot star, Compton effect, bremstrahlung, pi meson, nebula/M82 galaxy

ABSTRACT: The galaxy M82 (also called NGC 3034 and 3C 231), which is part of the Ursus Major group, is of special interest, since its relatively close position makes possible a comparatively detailed study of the nonsteady-state (explosion) stage of galactic development. It belongs in a special subclass of irregular galaxies whose members are characterized by an anomalously red light, high luminosity, considerable quantities of dusty matter with floccular structure, and the absence of high-luminosity hot stars. In this connection, the authors present formulas for calculating the energies and energy losses of the relativistic electrons in this galaxy - particularly with respect to the total energy of the light-emitting relativistic electrons, the energy losses due

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L 25773-66

ACC NR: AP6016379

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to the Compton effect, and the energy losses due to magnetic bremsstrahlung. It is shown that the total flux of Compton γ-rays from M82 equals the Compton losses. An evaluation of the bremsstrahlung flux of γ-rays due to the decay of π^0-mesons and bremsstrahlung is presented. The magnetic X-ray bremsstrahlung of M82 is evaluated on the assumption that the optical spectral index of M82 is close to the optical index $\alpha = 1.5$ of the Crab Nebula, which is correct only up to the frequency $\nu = 10^{18}$ cps. Orig. art. has: 12 formulas. [JPRS]

SUB CODE: 03, 20 / SUBM DATE: none / ORIG REF: 005 / OTH REF: 012

Card 2/2 CC

L 18776-66 EWT(1)/FCC/EWA(h) GW
ACC NR: AP6002741 SOURCE CODE: UR/0056/65/049/006/1950/1956

AUTHORS: Kuzhevskiy, B. M.; Syrovatskiy, S. I. 60 B

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Dependence of the chemical composition of cosmic rays on the nature of their motion in the galaxy

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 49, no. 6, 1965, 1950-1956

TOPIC TAGS: cosmic ray measurement, galaxy, cosmic radiation composition, chemical composition, helium, deuterium, hydrogen, cosmic ray particle, relativistic particle

ABSTRACT: The authors discuss the possibility of determining which model of the propagation of cosmic rays in the galaxy is closer to reality, on the basis of data on the chemical and isotopic composition of the cosmic rays. The two models customarily used in the analysis of cosmic ray propagation, namely the diffusion and the regular model,

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L 38962-65 FBD/EWT(1)/EWT(m)/EWG(v)/EEC-4/EEC(t) Pe-5/Pae-2/Peb/Pi-4
ACCESSION NR: AP5008827 DIAAP GW/WS-4 S/0026/65/000/003/0050/0058

AUTHORS: Ginzburg, V. L. (Corresponding member AN SSSR); Syrovatskiy, S. I. (Candidate of physico-mathematical sciences)

TITLE: New methods of investigating the universe

SOURCE: Priroda, no. 3, 1965, 50-58

TOPIC TAGS: radio astronomy, gamma ray, x ray, gamma ray absorption, quasi stars, neutron star, stellar astronomy, intergalactic matter, galactic radiation

ABSTRACT: A brief review is made of astronomical developments in the study of the universe. It is shown that one of the greatest contributions to man's understanding of the universe has been radio-astronomy. With the advent of space travel, satellites, interplanetary vehicles or outer space probes, two new non-optical astronomical observation methods have been introduced. These are gamma-astronomy and x-ray astronomy. These branches of astronomy had to wait for space missions because γ- and x-rays are absorbed by the terrestrial atmosphere. Photons with energies above [illegible] Mev constitute γ-rays and are generated by nuclear excitations, electron-positron annihilation, electron deceleration from speeds near that of light, the Compton effect, and by collisions of cosmic rays with interstellar gas nuclei forming neutral and charged π-mesons. This last source can give an indication of
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ACCESSION NR: AP5008827

the quantity of interstellar gases present in the universe. Explorer XI measurements give 50-Mev energies as the upper limit for cosmic γ-rays. Analysis of these data shows that the electron components of cosmic rays are substantially lower in the metagalactic state than in galactic space. Furthermore, γ-rays of metagalactic origin are isotropic, whereas those of galactic space are highly anistropic. The study of γ-radiation from intergalactic and interstellar spaces has led to the discovery of super-stars, now called quasi-stars, of yet unknown origin. Radiation from such stars could be caused by cyclotron radiation. More complete measurements will be possible in the near future with better gamma-telescopes on space vehicles. X-ray telescopes have been used on rockets and satellites primarily to measure x-rays of solar origin. These energies fall in the range of 1.5-6 kev and have helped astrophysicists investigate the fusion processes in the sun. X-rays of cosmic origin have pointed to the existence of neutron stars. Both γ- and x-ray astronomy are at their infancy but promise to be powerful keys to the understanding of the mysteries of the universe. Orig. art. has: 10 figures.

ASSOCIATION: none

SUBMITTED: 00 ENCL: 00 SUB CODE: AA

NO REF SOV: 005 OTHER: 000

Card 2/2 mt

L 25930-66 EWT(m) IJP(c)

ACC NR: AP6016663 SOURCE CODE: UR/0053/65/087/001/0065/0111

AUTHOR: Ginzburg, V. L.; Syrovatskiy, S. I.

ORG: none

TITLE: Cosmic magnetobremsstrahlung (synchrotron) radiation

SOURCE: Uspekhi fizicheskikh nauk, v. 87, no. 1, 1965, 65-111

TOPIC TAGS: bremsstrahlung, cosmic radiation, particle acceleration, relativistic particle

ABSTRACT: Magnetobremsstrahlung theory is reviewed and its role in radioastronomy and astrophysics is described. All of the necessary details are given for the application of the theory to astrophysical problems. Magnetobremsstrahlung is rather widespread in space: cosmic radio-radiation in most cases has magnetobremsstrahlung characteristics. This holds for the overall galactic radio-radiation, as well as for that from supernova, ordinary and radio galaxies, etc. Magnetobremsstrahlung is highly important in the study of the origin of cosmic rays and gamma- and x-ray astronomy. The nature of electromagnetic radiation from accelerating nonrelativistic and super-relativistic particles is discussed, and formulas are derived for individual electrons. This is compared with magnetobremsstrahlung from groups of elec-

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ACC NR: AP6016663

trons, and the Stokes parameters are defined. The influence of cosmic plasma on the propagation and radiation of electromagnetic waves is considered. It is pointed out that magnetobremsstrahlung radiation can be reabsorbed by relativistic particles, and the absorption coefficient is calculated. Certain applications of magnetobremsstrahlung are discussed in relation to cosmic plasma and magnetic instabilities. The more important formulas are summarized without proof. Orig. art. has: 8 figures, 4 formulas, and 2 tables. [JPRS]

SUB CODE: 20 / SUBM DATE: none / ORIG REF: 042 / OTH REF: 027

Card 2/2 FW

L 31467-66 EWT(1)/FCC GW

ACC NR: AP6023130 SOURCE CODE: UR/0053/66/088/003/0485/0504

AUTHOR: Ginzburg, V. L.; Syrovatskiy, S. I.

ORG: Physics Institute im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR)

TITLE: Origin of cosmic rays 12 39 B

SOURCE: Uspekhi fizicheskikh nauk, v. 88, no. 3, 1966, 485-504

TOPIC TAGS: cosmic ray, supernova, astronomic conference, galaxy, electron spectrum

ABSTRACT: It is argued that cosmic rays cannot be of metagalactic origin and that plasma effects are of fundamental importance to the further development of the astrophysics of cosmic rays; this also pertains to the quasars. According to the authors, the principal sources of cosmic rays in the Galaxy are the bursts of supernovae and possibly also explosions of the galactic nucleus. Emphasis is placed on the role of instability in the formation of the boundary of the galactic halo and in the isotropicization of the cosmic rays emerging from the Galaxy into the Metagalaxy. Allowance is made for the new knowledge that has been gained following the Jaipur Conference on Cosmic Rays in 1963. The Ninth International Conference on Cosmic Rays held in London (September 1965) is critically evaluated; at this conference no new proofs in favor of the theory of the metagalactic origin of galactic cosmic rays - unless the highest energies are concerned - were presented. It is shown that studies of the electron spectrum provide a means of verifying the

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ACC NR: AP6023130

hypothesis that a large part of cosmic rays (or more exactly, their electron component) is generated during powerful explosions of the galactic nucleus. Any proofs refuting this hypothesis would serve as a strong argument in favor of the local metagalactic theory of the origin of cosmic rays, but no such proofs have yet been presented; nevertheless, this theory merits further discussion. Orig. art. has: 5 formulas. [JPRS]

SUB CODE: 03 / SUBM DATE: none / ORIG REF: 032 / OTH REF: 027

Card 2/2 mc

L 36384-66 EWT(1) IJP(c)
ACC NR: AP6014054 SOURCE CODE: UR/0056/66/050/004/1133/1147

53
B

AUTHOR: Syrovatskiy, S. I.

ORG: Institute of Physics im. P. N. Lebedev, AN SSSR (Fizicheskiy institut AN SSSR)

TITLE: Dynamic dissipation of the magnetic energy in the vicinity of a neutral magnetic-field line

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 50, no. 4, 1966, 1133-1147

TOPIC TAGS: magnetic energy, kinetic energy, magnetic field, electric field, energy dissipation, magnetic energy conversion

ABSTRACT: Deformation of a magnetic field in a compressible conducting medium in the vicinity of zero field lines has been investigated. It was shown that upon a shift of the currents producing the magnetic field, certain regions appear in which an increase of the field gradients is accompanied by a decrease of density of the medium. Under certain conditions this leads to violation of the freezing field properties and to the appearance of strong electric fields which accelerate charged particles in the medium. The process is essentially nonstationary resulting in the conversion of excessive magnetic energy into fast-particle kinetic energy. The mechanism can be the cause of fast-particle generation under space conditions and in a laboratory plasma. Orig. art. has: 3 figures and 58 basic formulas. [Based on author's abstract.] [NT]

SUB CODE: 20/ SUBM DATE: 20Nov65/ ORIG REF: 008/ OTH REF: 003

Card 1/1 ns

SOV/163-58-1-12/53

AUTHORS: Baymakov, Yu. V., Shkol'nikov, S. N., Syrovegin, A. G., Marshikova, A.

TITLE: The Transition of Iridium in the Cathode Metal in the Electrolytic Refining of Copper and Nickel (Perekhod iridiya v katodnyy metall pri elektroliticheskom rafinirovanii medi i nikelya)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr 1, pp 55-61 (USSR)

ABSTRACT: By using radioactive isotopes the refining process of electrolytic copper and nickel was investigated. In electrolytic copper and nickel always gold, silver, and platinum elements occur, viz. gold and silver in quantities of 0,001 % and platinum in a quantity of 0,00001 %.
The behavior of iridium in the electrolytic refining of copper and nickel was investigated. The radioactive iridium isotope Ir^{192} was used as indicator. In the electrolysis of copper and nickel the concentration of iridium in copper approaches $(6 \div 20) \cdot 10^{-5}$ %. Usually in the electrolytic refining of copper from sulfate solutions with a density of

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The Transition of Iridium in the Cathode Metal in the Electrolytic Refining of Copper and Nickel

100-200 A/m^2 the iridium content in the cathode amounts to $(1 \div 9) \cdot 10^{-7}$ %. In the electrolytic refining of nickel from pure sulfate solutions at a temperature of 50°C and a current density of 100-300 A/m^2 the iridium content in the cathode amounts to $(5 \div 9) \cdot 10^{-7}$ %.
In sulfate solutions containing chloride ions and in pure chloride solutions the iridium content in the cathode amounts to $(1 \div 3) \cdot 10^{-4}$ %. The other platinum metals react similarly to iridium.
In the electrolysis of copper, iridium ion is formed by the following reaction:

$$Ir + 2\,Cu + \rightleftarrows Ir^{2+} + 2\,Cu^{+2}.$$

To produce metals of highest purity and with a minimum content of iridium the authors recommend using anode diaphragms in the analysis and carrying out the electrolysis of nickel at higher temperatures and that of copper at lower temperatures.
There are 11 tables and 1 reference, 1 of which is Soviet.

SOV/163-58-1-12/53

The Transition of Iridium in the Cathode Metal in the Electrolytic Refining of Copper and Nickel

ASSOCIATION: Leningradskiy politekhnicheskiy institut (Leningrad Polytechnical Institute)

SUBMITTED: October 1, 1957

Card 3/3

SYROVEGIN, A.G.

Behavior of antimony and arsenic during the electrolysis of copper in nitric acid solutions. Izv. vys. ucheb. zav.; tsvet. met. 2 no.3: 60-65 '59. (MIRA 12:9)

1. Leningradskiy politekhnicheskiy institut, Kafedra elektrometallurgii tsvetnykh metallov.
(Copper--Electrometallurgy)

SYROVEGIN, A.G.

Behavior of silver during the electrolytic refining of copper in nitrate solutions. Izv.vys.ucheb.zav.; tsvet.met. 2 no.4: 66-71 '59. (MIRA 13:1)

1. Leningradskiy politekhnicheskiy institut. Kafedra elektrometallurgii tsvetnykh metallov.
(Silver) (Copper--Electrometallurgy)

AUTHOR: Syrovegin, A.G. SOV/136-59-6-8/24

TITLE: Behaviour of Antimony and Arsenic During Electrolytic Refining of Copper in Nitric-acid Solution (Povedeniye sur'my i mysh'yaka pri elektroliticheskom rafinirovanii medi iz azotnokislykh rastvorov)

PERIODICAL: Tsvetnyye metally, 1959, Nr 6, pp 42 - 50 (USSR)

ABSTRACT: The behaviour of the most important impurities in the electrolytic refining of copper in sulphate solutions has been thoroughly investigated (Refs 1-7). For certain purposes very high-purity copper is required. Copper deposited from acid sulphate solutions contains traces of S which cannot be removed. The only way to avoid S contamination is to use different solutions. Their application, however, is limited by the fact that harmful impurities which enter the electrolyte during electrolysis from the anode may be deposited at the cathode. Thus, hydrochloric acid and chloride solutions are unsuitable as As and Sb and Bi are co-deposited with Cu. Ammoniacal electrolytes cannot be used as Pb, Hg, Cd, Bi and Ni are co-deposited with the copper at the cathode. From theoretical considerations, nitric acid appeared to be a

Card1/8

suitable electrolyte and hence refining of copper from such a solution was studied. As Sb and its oxides are practically insoluble in nitric acid, polarisation curves for this metal were obtained from a double tartrate solution of SbO and K. The electrode potentials were measured against a saturated calomel electrode. From the polarisation curves shown in Figure 1 it can be seen that refining of copper from nitric acid electrolytes is possible at high current densities (300 - 400 A/m^2). The potential of the unpolarised copper electrode is more electro-positive in nitric-acid solution than in a sulphate solution and polarisation of the copper cathode in nitric-acid solutions is negligible, even at very high current densities. In order to establish the most favourable conditions for electrolysis, the composition of the solution and the conditions under which dense crystalline deposits of cathode copper are obtained, at a maximum cathode efficiency, were studied. Copper nitrate is easily soluble in water and its concentration in a

 saturated solution is several times greater than the

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solubility of copper sulphate. Besides, the electrical conductivity of acid copper nitrate solutions increases with an increase in copper concentration up to 3 N. Therefore, the copper content of the solution can be increased up to 55 - 75 g/l. without danger of salts crystallising out on the walls and electrodes. During electrolysis in nitric acid solution the consumption of nitric acid increases. In order to elucidate the reasons for this, experiments were carried out in which the nitric acid content after electrolysis was analysed. The results are shown in Table 1. The higher the temperature of the solution, the greater the rate at which nitric acid is consumed. This was found to be due to an acceleration of the chemical solution of copper. In order to get satisfactory copper deposits, a moderate temperature and rather low current densities must be used. A great number of experiments have shown that the cathode efficiency of copper is quite high ($\leq 90^{0}$) despite the acidity of the solution, which can be as high as 60 g/l. HNO_3. The anode efficiency is 105 - 108%. On the

basis of the above experiments, it was concluded that refining of copper in a nitric-acid solution is possible. In order to improve the quality of the cathode deposit and to make the nitric acid solution more stable in operation and also to increase the cathode efficiency, the influence of such addition agents as citric acid and urea was investigated (Ref 14). Sb and As were chosen for studying the co-deposition of impurities, as their standard potentials are very close to the standard potential of copper. In Figure 2, the dependence of Sb and As content in the cathode deposit on the free nitric acid concentration is shown. The influence of copper concentration of the electrolyte on the Sb and As content in the deposit is shown in Figure 3, from which it can be seen that an increase in copper concentration of the electrolyte from 40 - 90 g/l. lowers the impurity content deposited at the cathode only exceedingly slightly. The change in As and Sb content in the deposit in relation to their concentration in the electrolyte is shown in Figure 4, and the

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dependence of the Sb and As content on current density in Figure 5, from which it can be seen that at high current densities copper and arsenic ions begin to be discharged simultaneously. Sb and its oxides, being practically insoluble in nitric acid, can be expected to go to the anode slime. Two series of experiments were carried out. In one, an anode containing 0.19% Sb was placed into a collodium diaphragm, and in the other, electrolysis was carried out without a diaphragm (Table 2). From the results of Table 2, it can be seen that the rate at which the Sb content of the solution increases in both cases is identical. Hence, it can be concluded that in an acid electrolyte Sb can exist in the ionic state in rather large quantities. Experiments on the anodic solution of Sb in a nitric-acid solution were also carried out, in which it was found that a large portion of the anode becomes immediately oxidised to antimonious acid, which falls to the bottom in the form of white flakes. At the cathode, Sb deposits and after some time a platinum cathode becomes covered with a black deposit of finely dispersed metallic Sb.

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The formation of an SbO_3^{3-} anion in acid solutions is improbable (Ref 18). The formation of five-valent ions (Ref 4), together with ions of tri-valent Sb, is possible. The kinetics of the deposition of impurities at the copper cathode is shown in Figure 6 and in Table 3, where the relationships between the simultaneous discharge of Sb, As and Cu ions and the cathode potential, are shown. Polarisation curves (Figure 7) were obtained in electrolysis experiments, in which the potentials were closely watched (Ref 19). In Table 4, distribution coefficients calculated for the simultaneous discharge of Cu, Sb and As ions in nitric-acid solutions are shown. As the result of the above experiments, the author has arrived at the following conclusions:

1) Deposition of high-purity Cu is possible from nitric-acid solutions.

2) The composition of a solution from which high-purity copper can be deposited by electrolysis has been found.

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It consists of 2-3 N $Cu(NO_3)_2$, 0.15 - 0.3 N HNO_3, 3 g/l. urea or 5-10 g/l. citric acid. The working temperature range is 18 - 35 °C and the current-density range is 150 - 350 A/m^2.

3) The decrease in nitric acid content during electrolysis is due to the chemical solution of Cu. This ceases completely on adding urea, which enables metal at 100% current efficiency to be obtained.
Reduction of Sb and As ions takes place simultaneously with that of copper ions. This is in accordance with the retarded discharge theory. As Sb ions are discharged, a shift in potentials in the electro-positive direction is observed as the result of de-polarisation. No de-polarisation occurs with As.

5) The distribution coefficients for Sb and As have been calculated. They are of the order $n \cdot 10^{-4}$ %.

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There are 7 figures, 4 tables and 20 references, 16 of which are Soviet, 3 English and 1 German.

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